Teaching Statement

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Good teaching does not only transfer knowledge, it creates intellectual community. At the university level community is particularly important, since professors are cultivating future colleagues. In a poorly-taught classroom, information flows only from teacher to student, assessment functions to separate "good" students from "bad", and the students' motivation is taken for granted. In a classroom built on intellectual community, the teacher actively seeks feedback from the students and encourages the students to mentor one another, assesment allows students to monitor their own progress and for the teacher to assess their own teaching, and the teacher works to contextualize the material within the students' interests.

I have been teaching throughout my adult life, and my experience has helped me learn both how to create community and why it is valuable.

- I worked as a university-level teaching assistant both as an undergraduate in engineering and, as a PhD student, for the graduate-level applied statistics course. I received a university teaching award for my teaching at the graduate level.
- I was a full-time teacher for two years as a Peace Corps volunteer in Kazakhstan teaching math and English as a second language (ESL). During this time, I wrote a math textbook in simple English for middle-school ESL students. I also organized multiple extracurricular classes for my community in math, music, and pedagogy.
- As a PhD student, I volunteered for a year and a half teaching math courses, including statistics, to inmates at San Quentin prison with the Prison University Project (PUP).

Futhermore, many of my other professional activities, though not explicitly in a classroom, have had a teaching component. In these activities, community-based thinking is as valuable as in the classroom.

- I have acted as a formal and informal mentor to numerous PhD students, both as part of the student mentorship program at UC Berkeley and as a postdoctoral researcher at MIT. As a senior engineer at Google, I acted as an official mentor for several junior engineers and was the technical lead for a small research team.
- For most of my PhD, I organized and conducted my own reading group for any interested students on topics including variational Bayes, Bayesian non-parametrics, differential geometry, the bootstrap, and functional analysis.
- I have provided statistical consulting services in many settings, including in the UC Berkeley statistical consulting class, as a fellow in the Berkeley Institute of Data Science, as a private contractor, and, for several years as a member of UC Berkeley's chapter of the National Security Agency Statistical Advising Group (NSASAG).

For the remainder of the essay, I will describe instances when I was able to enact the community-based practices of two-way communication, non-judgemental feedback, and the cultivation of intrinsic motivation.

Cultivate intrinsic motivation. During my second year as a PhD student at UC Berkeley, I was asked by Prof. Bin Yu to be her teaching assistant for the graduate-level course in applied statistics. The course was organized around a number labs using real-life datasets, and my reponsibilties were to give weekly lectures, hold office hours, and grade the written labs. In addition, Prof. Yu asked me to add a reproducible research component to the course based on my experience at Google, to which end I incorporated Github, code readbility, and unit testing into the lab requirements.

I quickly realized that simply teaching code readability and making it a component of the grade was insufficient. The students — who were otherwise very highly motivated — simply did not see the importance of readability enough to change bad habits. To address this, I designed an in-class exercise in which the students had to "reproduce" a simple analysis written by me. In my code, I deliberately and systematically violated all the code readbility guidelines I was trying to teach. As a result, it was quite difficult to understand what my analysis was doing. To sweeten the pot, I put a small but meaningful error in the code and challenged the students

to find it. The students loved the puzzle-solving aspect of the assignment and, to my delight, spent much of the hour complaining about my terrible style. Following this assignment, the labs' code readability improved considerably.

Evaluate productively. Evaluating students' performance is a part of every classroom, but its role in a community-based classroom is ideally productive and as non-threatening as possible.

Useful evaluation is frequent, transparent, and conducted via many modalities. When I taught in the Peace Corps, at PUP, and at UC Berkeley, as much as possible I compute students' grades from many small projects rather than a few large ones, let the students monitor their own progress, and based the grade on many different modes of performance, including in-class participation, homework, exams, and group work. In this way, struggling students can ask for help early and feel empowered to improve their grade; in the applied statistics course I helped teach at UC Berkeley, some of the students who began with the weakest backgrounds went on to become some of the strongest students through frequent feedback and a lot of one-on-one help in office hours.

Math teachers often have to accomodate a wide range of student abilities and backgrounds, and my introductory statistics class at San Quentin University through the Prison University Project (PUP) was particularly extreme in this regard. Some students had been at the top of their class when they were younger, some were very intelligent but had only learned basic arithmetic as adults through PUP. My goal was to design exercises which accomodated this range of abilities and needs without leaving anyone discouraged or bored. To this end, I reduced the proportion of the class devoted to lectures and increased the time available for individual or group work while I walked around and answered questions. I would design problem sets for such periods with the expectation that *no* student would be able to complete the whole thing in the time allotted. In this way, the faster students could quickly proceed to more challenging problems, the slower students could spend more time with concepts that were new to them. When I found the same question was being asked repeatedly, I would bring everyone together for a brief lecture on the question, and then return to individual work. In this way, I helped create a classroom environment that accomodated everyone's abilities, and got a lot of feedback for myself about the students' progress.

Encourage multi-way communication. A teacher can learn from the students whether their teaching is effective, and can even often gain valuable insights themselves when students interpret material in new ways. Futher, by evaluating each others' work, students canderive motivation from their peers and build community amongs themselves.

Statistical consulting, though not a classroom setting, is teaching-adjacent venue in which two-way communication is particularly important. Rarely, I have found, does a petitioner actually ask a useful statistical question at first, and a statistical consultant provides the most value by first listening carefully to the problem details. For example, as part of the NSASAG, we were asked how to compute low-rank approximations of matrices with some given statistical properties. Upon pressing for more information about the motivation, I learned that all that was actually needed was the computation of a t-statistic based on a linear form of a high-dimensional parameter, which I saw could be computed exactly using the conjugate gradient algorithm with no recourse to low-rank approximations.

It is crucial that a good teacher have a written lesson plan, but just as crucial that they check regularly that students are keeping up with it. For example, most technical lectures have many points at which minor inferential steps can be made into a short, minute-long exercise. When I gave my lectures for the UC Berkeley applied statistics course, I built in explicit pauses for the students to work out such exercises, which both required the students to remain actively engaged and revealed if the exposition is going too quickly. Similarly, when teaching at PUP, I found short, low-stakes, written in-class quizzes at the beginning of class to be particularly effective at checking in on students.